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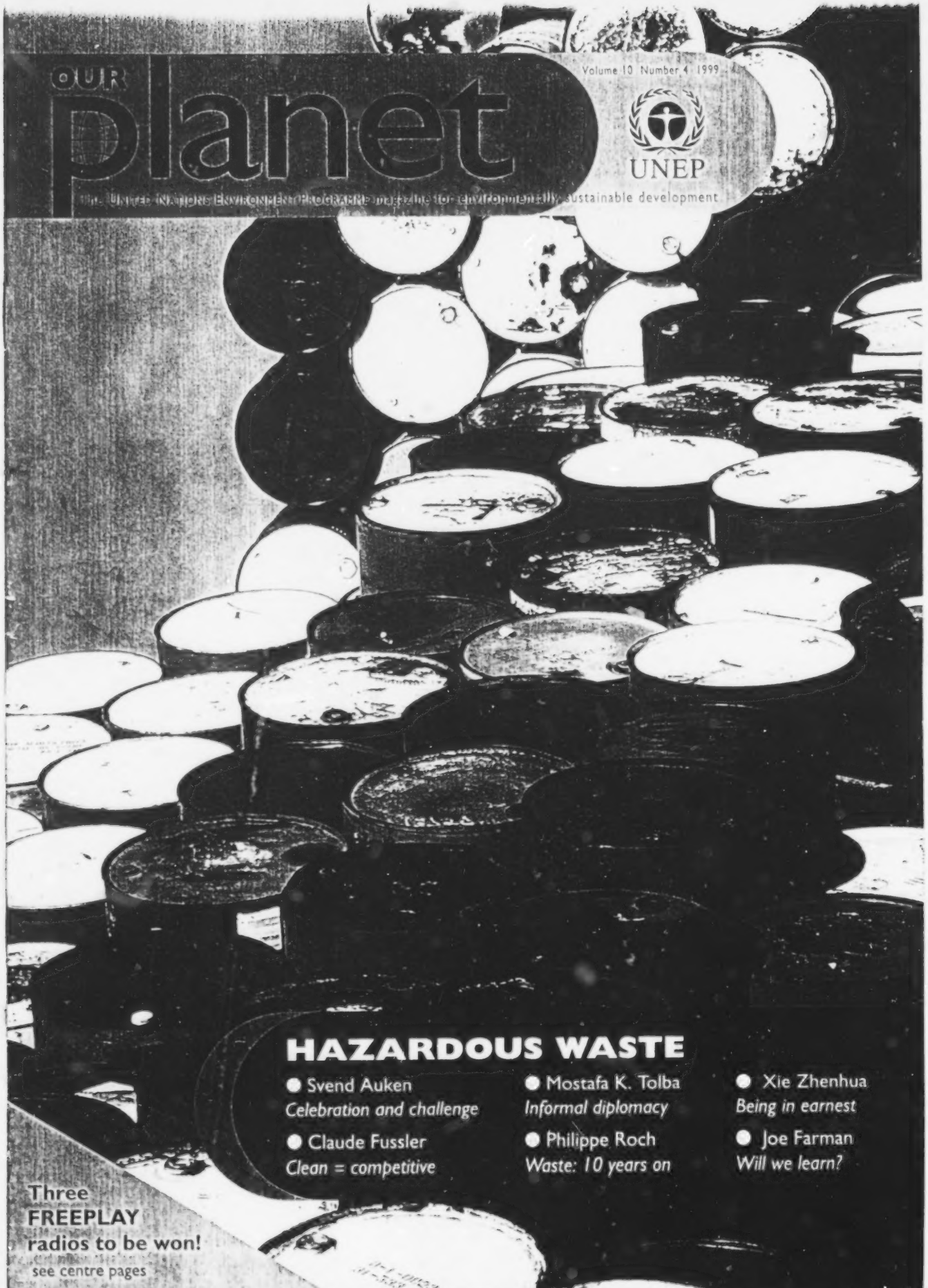

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Editorial

B. Walsh/UNEP

KLAUS TÖPFER
United Nations Under-Secretary General and Executive Director, UNEP

A global foundation for safeguarding public health and the environment is taking hold, giving people living today and generations to come greater assurance of protection from the risk of toxic chemicals. A central pillar is the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which celebrates its 10th anniversary this year.

In December 1999, the Fifth Conference of the Parties to the Convention will meet, appropriately, in Basel, Switzerland. It will be a time to honour the many accomplishments achieved under the Treaty, including the fact that there are now 131 Parties to the Convention. They have consolidated the Convention's control system, legal framework, and operation through improved classification of wastes and refined hazard classification.

WIDENING THE NET

Implementation is making significant gains, due to an enlarged scope that now includes patterns of production, product design, technological innovation, and consumer behaviour. Partnerships with stakeholders and the establishment and strengthening of regional centres for training and technology transfer are advancing progress still further. The result is worth celebrating – an increasingly effective international system of environmental safeguards that delivers a more secure quality of life for nations worldwide.

The December meeting will also be a time to come to grips with remaining challenges. These include liability and compensation issues, improved reporting, additional policy tools and ways of accessing international funding, and prevention and monitoring of illegal traffic in hazardous and other wastes. A bellwether item will be a declaration that looks forward to the next decade of the Convention. The vision reflected in this declaration will be an important signal for the future of international environmental protection.

Keeping the environment and people safe from harmful chemicals goes beyond sound management of wastes. It means using cleaner production philosophies to avoid the generation of hazardous wastes, changing consumer preference and patterns, and promoting the adoption and use of environmentally sound technologies in urban management. These are all priorities of UNEP.

BUILDING FOUNDATIONS

A global foundation is essential for sustainable development in the next millennium, and UNEP is at the forefront of building it. UNEP is leading the way in identifying emerging issues, facilitating negotiations, providing information on alternatives and technology, and helping countries develop the technical capacity for the environmentally sound management of chemicals.

The world can take heart from the development of additional instruments of global environmental protection from toxic risks. September 1998 marked the adoption of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals in International Trade. UNEP and the Food and Agriculture Organization of the United Nations provide the secretariat for this Convention during the interim period before it enters into force.

COMPLEMENTARY TREATIES

The Rotterdam Convention, in many ways, is a logical complement to the Basel Convention because it applies to the transboundary movement in commerce of banned or severely restricted chemicals, as well as severely hazardous pesticide formulations. The Convention sets reporting provisions that enable Parties to make informed decisions about the import of such toxic chemicals. Until the Rotterdam Convention enters into force, which is expected in 2001, the provisions are being implemented voluntarily by the 155 governments currently participating in the voluntary Prior Informed Consent (PIC) procedure.

Negotiations are now under way on an international legally binding treaty to reduce and/or eliminate releases of persistent organic pollutants (POPs) into the environment. One hundred and fifteen countries participated in the third round of talks, and the fourth is scheduled for 20-25 March 2000 in Bonn. The negotiations, for which UNEP provides the secretariat, will be completed in 2000.

Links between the POPs treaty being negotiated and the Basel Convention are key to the evolving global foundation of safeguards. Many of the POPs under negotiation, like polychlorinated biphenyls (PCBs), are significant issues under the Basel Convention. Many other POPs are found in abandoned stockpiles of obsolete pesticides, or are generated through certain waste destruction practices.

As the December anniversary of the Basel Convention approaches, let us deepen our commitment to a global foundation for safeguarding public health and the environment from toxic chemicals, and so enter a new era of sustainable development ■

Celebration AND challenge

SVEND AUKEN describes the achievements of the Basel Convention in handling hazardous waste, and outlines how it can be improved

Early in December, ministers for the environment will meet in Basel to celebrate the 10th anniversary of the Basel Convention.

There can be no doubt that the creation of an international legal framework to control the transboundary movement of hazardous waste is an achievement worth celebrating. The threat to human health and the environment from hazardous waste is a worldwide problem, and coming to grips with pollution from industrial processes and products is a challenge to every nation.

During the first years of the Convention it became clear that the export of hazardous waste to developing countries had to be tackled as a specific issue. Many developing countries do not have the administrative and scientific resources to handle such imports. There is a moral obligation to protect them from the risks involved.

In 1995, therefore, a decision was taken to ban exports of hazardous waste from OECD to non-OECD countries. The proposal was put forward by the developing countries themselves and adopted unanimously. A number of countries have adjusted their national legislation accordingly but, unfortunately, too few have so far ratified this important amendment to the Convention. I hope that enough countries will join up in the near future for the ban to become effective worldwide early in the new millennium.

We have come a long way in defining what is needed at the global level to reduce and control the transport of hazardous waste across borders and to enhance its environmentally sound management. But there are many unsolved questions. When we meet in Basel the most important one will be: What happens if something goes wrong?

Liability and compensation

The meeting, the Fifth Conference of the Parties to the Basel Convention, is about to adopt a protocol on liability and compensation for damage resulting from the transboundary movement of hazardous waste and its disposal. This has been under negotiation since 1995, with the aim of making exporters and disposers of hazardous waste liable for any damage that may occur during operations – and to make it compulsory for them to be insured against it.

The adoption of the protocol will be an epoch-making achievement in the history of multilateral environmental agreements. It will be the first of its kind and will create an important precedent for others to follow.

There are, however, a few remaining issues. The most important is whether we need special funding for damages when the companies involved cannot meet the financial burdens, or when the damage results from the illegal trafficking of hazardous waste. Personally, I have little doubt that we do, and I support the proposal made by the developing countries to make funding available to take care of 'worst-case scenarios'. I sincerely hope we will succeed in finding a solution to this question in Basel.

Decisions on the protocol and on funding will be major steps forward. But we also need to look ahead. The time has come to address the generation and management of hazardous waste comprehensively – to minimize the quantities produced and ensure that their management is environmentally sound.

If we are to minimize wastes, our economies must be restructured towards cleaner production. Business will have to be actively involved and the capacity of institutions to manage effectively will have to be strengthened. There will have to be a strong focus on capacity building, including at the state level where issues of compliance are handled.

Inadequate legislation

Illegal traffic is a special challenge. To cope with it, there must be a decisive effort to strengthen the legal framework and administrative capacity to handle hazardous waste. A recent survey made by the Secretariat of the Basel Convention showed that legislation on preventing and punishing illegal traffic is inadequate or non-existent in a large number of countries. The same goes for coordination between ministers and procedures for returning illegal shipments.

We must increase cooperation to make up for these shortcomings. We must assist in providing the national legislation and administrative instructions and capacity needed to effect control procedures, such as written notification and consent, and to enhance capacity for enforcement.

Regional and subregional training centres are crucial partners in creating the momentum we need to implement the Convention. Significant progress has been made in establishing such centres. But they need to be strengthened if they are to play their full part in the process of building the institutional capacity to implement the Convention effectively, to ensure compliance and to deal with illegal traffic. And they should expand their partnerships with industry and non-governmental organizations to contribute to the move towards cleaner production and sound management. Securing a multi-year financial basis for the important activities of the regional and subregional training centres is one of the issues we must address in Basel.

Avoiding conflict

Having solved the question of liability and taken decisive steps to implement the Convention and its Protocols, we then have to initiate a process to improve the Convention further.

The present voluntary regime for the settlement of disputes is obviously inadequate. There is a potential for conflict between the international trade regime of the World Trade

Typhoon/AP

Thomas Raupp/Still Pictures

Organization (WTO) and the trade measures of different multilateral environmental agreements – including the Basel Convention. We cannot allow a situation where disputes arising from trade measures in an environmental agreement are brought before the WTO, and settled from the point of view of trade. We need to have effective mechanisms for the settlement of disputes within the multilateral environmental agreements themselves. Finding a solution to this is another opportunity for the Basel Convention to make a breakthrough in international law on the protection of human health and the environment.

The challenges ahead may seem overwhelming, but I am convinced that participants will work hard at Basel to remove obstacles to progress and show the way to decisive improvements in our dealing with hazardous waste over the next decade.

I am looking forward to celebrating the anniversary of the Basel Convention in this spirit – a spirit worthy of the intentions laid down in it 10 years ago ■

Svend Auken is Minister for Environment and Energy, Denmark.

INFORMAL DIPLOMACY

MOSTAFA K. TOLBA tells Geoffrey Lean how last-minute talks between delegates who trusted each other saved the treaties on hazardous wastes and the ozone layer

It was a moment of high drama. Ten years ago, ministers from around the world had just gathered in the Swiss city of Basel to put the finishing touches to the Convention controlling the import, export and disposal of hazardous waste. Despite two years of work and negotiations, some points still had to be settled, but it looked as if they could be resolved by the end of the three-day meeting.

Then, on the morning of the first day, the delegate representing the African states proposed some 30 different amendments to parts of the text of the Convention that had already been agreed. Suddenly the achievable seemed impossible, the delicately constructed package appeared in danger of being torn apart.

Meeting adjourned

Mostafa Tolba, then Executive Director of UNEP, turned to Flavio Cotti, then the Swiss Minister of the Interior and one of the architects of the Convention, who was in the chair, and asked him to adjourn the meeting before any other ministers could speak, and to request that the African representatives, leaders of other delegations with unresolved points, and Tolba, join him in a side room.

'We sat there from 10.30 in the morning until 10 or 11 at night,' remembers the Egyptian scientist and former politician who led UNEP from 1974 to 1992. 'I did not let people leave the room. That was a must. Nobody would leave until we agreed.'

He recalls how they went through the text and agreed that most of the issues raised by the African states had been taken into consideration, and that the five or six others could be resolved. They reached agreement, and the Convention was unanimously adopted by the 116 states at this Conference of Plenipotentiaries, though it was some time before the African countries signed it.

It was the second narrow squeak for Dr. Tolba in just a few days. Just before the ministers arrived, during the preparatory negotiations, he suffered a mild heart attack and was rushed to hospital for an operation. But he was soon back at the talks again.

'In spite of the exhaustion and tiredness and so on, it gave me joy that governments were responding to something of significance to every human being on Earth. And it was very good to go back to UNEP's headquarters in Nairobi and to call a meeting of the staff and tell them that the achievement was due to the effort of each and every one of them.'

An effective procedure

Dr. Tolba got the idea of the small informal negotiating group from the late Winfred Lang, then the head of the Austrian Foreign Minister's office, who chaired the negotiations that led to the Montreal Protocol on Substances that Deplete the Ozone Layer. He tried it first in the penultimate negotiating meeting in Geneva, but it came into its own in Montreal, where he used the same procedure as he was later to follow in Basel.

With three days to go and the ministers arriving, the European Community (EC) and a group comprising the United States of America and most other developed countries, were still far apart on the crucial article of the Convention, despite meeting in an informal group every day for a week into the small hours of the morning. As in Basel, the meeting was adjourned before any ministers had had the chance to speak.

Dr. Tolba recalls: 'I told them that if you start making your statements as ministers each one of you is going to say "the position of my government is the following...". Once you state this in the open behind the microphone you

Rhodes/Topham

will not budge from it. And I want to have the next one or two days to try to figure out if we are going to get an agreement.'

A question of votes

After two days of informal negotiations in a small group, he said, the one remaining issue was how many votes the EC would have in the meetings of the Parties to the Protocol. A formula was worked out, but three of the smaller European countries were still resisting, and there seemed to be no hope of agreement. But then Laurens Jan Brinkhorst, the chief EC delegate, rang each of their prime ministers and persuaded them to join the consensus. The group was then reconvened and the deal finalized – but remained so delicate that it could not even be put into the proper legal language without risking it falling apart.

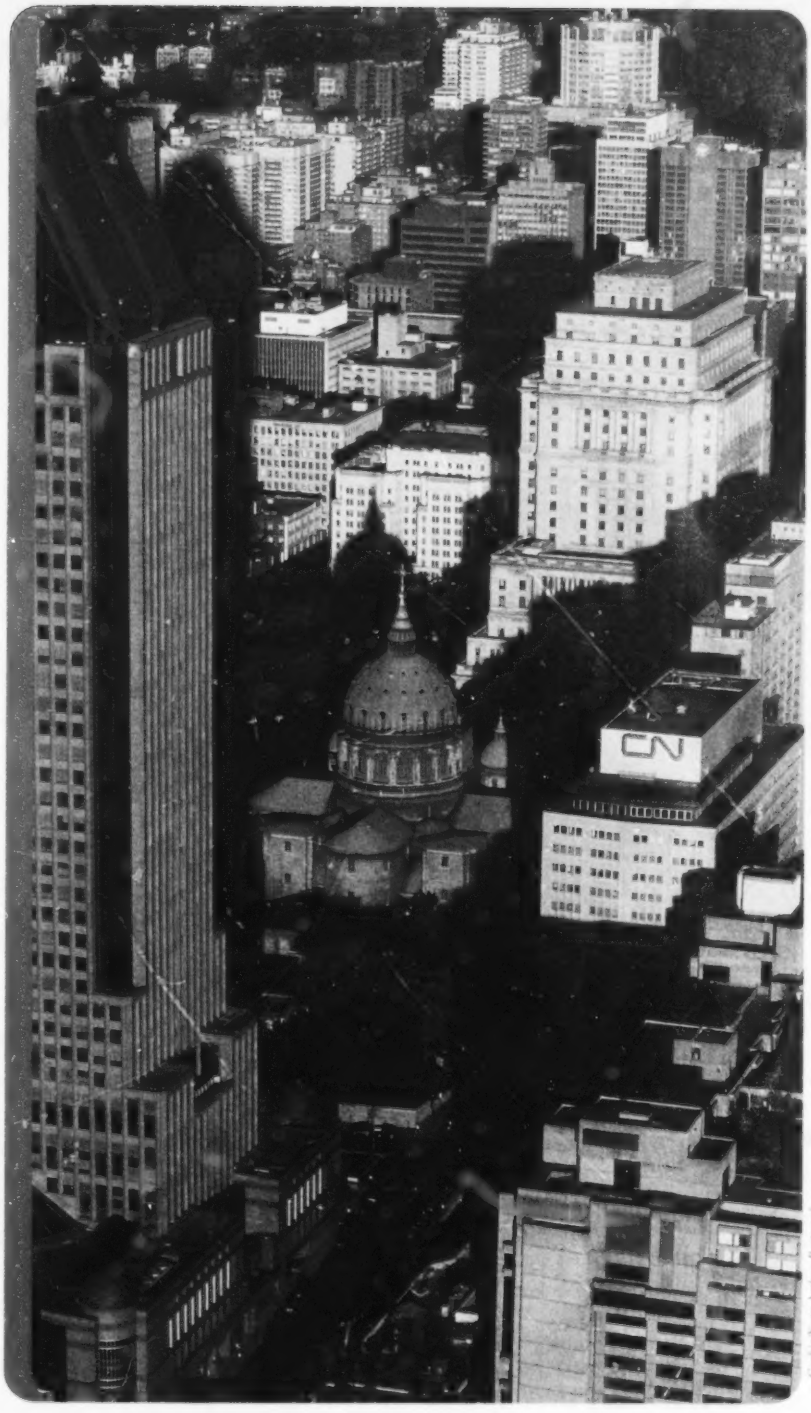
The weary group went off to a reception held by the Mayor of Montreal and Dr. Tolba recalls how the Swedish Environment Minister, Birgitta Dahl, got out of the car behind his 'with a very long face'. He goes on: 'She said: "How's it going?" I replied: "Birgitta, I have the treaty, here it is," and she jumped on the pavement and hugged me and kissed me, and the whole thing turned to real joy.'

Becoming friends

Dr. Tolba says: 'The informal consultations were the key. When the government negotiators sat in smaller groups, 10 or 15 of them with really different views, talking to each other not past one another, they started to become friends, they started to see one another's point of view and tried to accommodate each other.

'I learned the importance of personal human relations between the people who are negotiating, of perseverance over a long period of time. It was also important to have continuity in the government representatives, so that they were not changing all the time with newcomers coming in who knew nothing about the past.' He adds that his key staff, including Iwona Rummel-Bulska, had also, crucially, become friends with their counterparts on national delegations.

I learned the importance of personal human relations



Corbis/Yann Arthus-Bertrand

The science had to be right, and presented well to the negotiating groups, he added, and you had to be objective. 'People may not like you, but if they see you are objective in the interests of the environment, they respect you.'

In the end, he says, it all comes down to trust, 'persevering with personal human relationships, and making a group of friends' ■

Yang Zi Jiang/UNEP/Topham

BEING IN EARNEST

XIE ZHENHUA describes China's implementation of the Basel Convention

China was among the first countries to join the Basel Convention. We have not only actively participated in its international activities, but also earnestly carried out its various duties. Our efforts in implementing it can be summarized as:

1. To promulgate and issue laws and regulations on waste management.

In October 1995, the National People's Congress adopted the Law on the Prevention and Control of Environmental Pollution by Solid Wastes of the People's Republic of China. The guiding ideology and principles in making this Law well reflect the tenet of the Basel Convention to minimize hazardous wastes to the greatest extent possible. The Law set down fundamental management systems, such as a system of waste registration, a permit system for dealing in hazardous waste, a system of reporting sheets on their movements, and so on – all of which are being implemented.

At the beginning of the 1990s, the state advocated cleaner production measures in some industries, thereby reducing wastes. The Central Government adopted the economic policy of encouraging their comprehensive use, which helped to raise the utilization rate for solid wastes to 43 per cent. Cities are now building their own centralized disposal facilities for hazardous wastes and municipal solid wastes.

2. To issue the *National Catalogue of Hazardous Wastes.*

In January 1998, the State Environmental Protection Administration (SEPA) – the Government department responsible for implementing the Basel Convention – together with the Commission of Economy and Trade, the Ministry of Foreign Trade and Economic Cooperation, and the Ministry of Public Security, issued the *National Catalogue of Hazardous Wastes*, which listed 47 different types, their sources and the hazardous substances they contain. Methods, labels and standards for identifying hazardous wastes are now being established.

3. To implement the permit system for waste imports.

China has been practising the environmental management of waste imports ever since 1991. In April 1996, SEPA, with five other ministries and commissions, jointly issued the *Provisional Environmental Management Regulation on the Import of Waste* – which lists 10 kinds of wastes which can be used as raw materials but whose import is restricted. These include: waste steel, waste copper, waste aluminium, waste plastics, waste ships and waste electronic hardware equipment. All the wastes on the list can only be imported after the local and central environmental departments complete their examination and give approval.

Those wanting to import wastes must commission technical units to evaluate the possible environmental impact, examine countermeasures, and compile an

Kyung il Jeong/UNEP/Topham

Evaluation Report. SEPA examines all the Waste-Import Applications and Evaluation Reports on Environmental Impact, and gives permits for importing wastes to those who meet the necessary criteria. The potential importer can then go on to the next procedure, reporting to the commercial inspection department at the port and the customs office, which give their permission if the cargo meets their respective requirements.

4. To find and punish cases of illegal transboundary movement of wastes.

Certain industrialized countries began illegally transporting wastes to China at the end of the 1980s. By the early 1990s, this had developed into a trend and the number of cases was increasing. China then adopted resolute measures to prevent imported pollutants and protect the environment. In 1993 imported chemical industrial wastes were found in Nanjing, and in 1995 municipal wastes were imported to Nanchang. In both cases, the environmental department charged the parties involved to return the wastes to the lands of origin. Cases of illegal import of 'foreign wastes' were also identified, and dealt with, in some regions in 1996. These Government actions greatly enhanced the public's environmental awareness and curbed the increasing trend of illegally importing wastes.

China itself produces hazardous wastes for which it has no treatment facilities, and which therefore need to be exported to other countries for disposal. On these occasions, it always strictly abides by the procedures specified in the Basel Convention and respects the laws of the waste-importing countries so as to ensure that they are disposed of properly. Over the past five decades, SEPA has handled more than 30 instances of exporting hazardous wastes (with a total amount of more than 70,000 tonnes) to industrialized countries for disposal.

Together with other Parties to the Basel Convention, China will make its contribution to preserving the Earth we live on

5. To establish a Center for Technology Transfer and Training on Hazardous Wastes.

SEPA established the National Center for Technology Transfer and Training on Hazardous Wastes in the Qinghua University in March 1993 to strengthen China's management of hazardous wastes and better implement the Basel Convention. This Center was later developed into an Asia-Pacific Center for Technology Transfer and Training on Hazardous Wastes, a plan proposed by China and ratified by the Conference of the Parties to the Convention. The Center provides technical consultants and technology training and transfer in hazardous waste management and disposal to over 42 countries and regions in Asia-Pacific. So far, it has operated well and played its due role in improving the management and disposal of hazardous wastes in the region.

China still lags behind industrialized countries in hazardous waste management and overall environmental protection targets because of the constraints imposed by its levels of economic development, technology and management, among other factors. It has not yet set up either a sound hazardous waste management system, or centralized waste disposal facilities. And the capability of the people managing hazardous wastes needs to be improved.

In order to realize the goal of zero-discharge from major industries, China will focus its efforts on:

- Strengthening law enforcement.
- Controlling pollution by hazardous wastes and improving their comprehensive use and disposal.
- Drafting and issuing the National Program for Centralized Hazardous Wastes Disposal Sites in the Tenth Five Year Period.
- Selecting priority projects for controlling solid wastes.
- Using economic incentives to promote waste minimization.
- Further promoting cleaner production.
- Intensifying international cooperation and exchange of waste management information.

Throughout, China will take effective action to minimize hazardous waste and its movement across boundaries, and to dispose of it in suitable sites in an environmentally harmless way. Together with other Parties to the Basel Convention, China will make its contribution to preserving the Earth we live on ■

Xie Zhenhua is Minister of the State Environmental Protection Administration, China.

International Declaration on Cleaner Production

UNEP

We recognize that achieving sustainable development is a collective responsibility. Action to protect the global environment must include the adoption of improved sustainable production and consumption practices.

We believe that Cleaner Production and other preventive strategies such as Eco-efficiency, Green Productivity and Pollution Prevention are preferred options. They require the development, support and implementation of appropriate measures.

We understand Cleaner Production to be the continuous application of an integrated, preventive strategy applied to processes, products and services in pursuit of economic, social, health, safety and environmental benefits.

To this end we are committed to:

LEADERSHIP
Using our influence

• to encourage the adoption of sustainable production and consumption practices through our relationships with stakeholders.

AWARENESS EDUCATION AND TRAINING
Building capacity

• by developing and conducting awareness, education and training programmes within our organization;

• by encouraging the inclusion of the concepts and principles into educational curricula at all levels.

INTEGRATION
Encouraging the integration of preventive strategies

• into all levels of our organization;

• within environmental management systems;

• by using tools such as environmental performance evaluation, environmental accounting, and environmental impact, life cycle, and cleaner production assessments.

RESEARCH AND DEVELOPMENT
Creating innovative solutions

• by promoting a shift of priority from end-of-pipe to preventive strategies in our research and development policies and activities;

• by supporting the development of products and services which are environmentally efficient and meet consumer needs.

COMMUNICATION
Sharing our experience

• by fostering dialogue on the implementation of preventive strategies and informing external stakeholders about their benefits.

IMPLEMENTATION
Taking action to adopt Cleaner Production

• by setting challenging goals and regularly reporting progress through established management systems;

• by encouraging new and additional finance and investment in preventive technology options, and promoting environmentally sound technology cooperation and transfer between countries;

• through cooperation with UNEP and other partners and stakeholders in supporting this declaration and reviewing the success of its implementation.

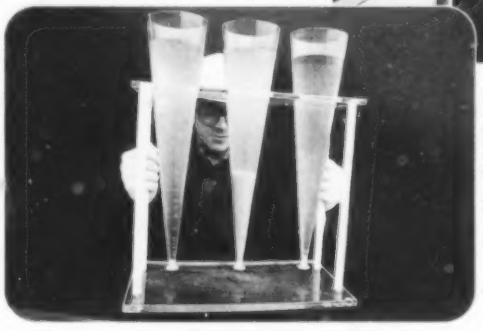
UNEP
International Declaration on Cleaner Production
Signatory Summary
As of September 10, 1999

National Governments	34 countries
Provincial, State and Local Governments	9 signatories
Companies	41 signatories
Business Associations, Industry and Professional Associations, Consultants	36 signatories
Non-Governmental Organizations	5 signatories
Academia, Societies, Cleaner Production Centres, Working Groups and Productivity Councils	30 signatories
International Agencies and Inter-Governmental Organizations	4 signatories
TOTAL	159 signatories

(The actual number of signatories is greater than 1,000. The number indicated includes only organizations signing with high-level representation.)

CLEAN = COMPETITIVE

CLAUDE FUSSLER shows how pointing the compass to eco-efficiency brings rapid benefits to the bottom line



Photos: Mark Edwards/Still Pictures

Any waste, obviously, is bad for our environment – and of course, hazardous waste is especially dangerous to our health as well. But all waste, hazardous or otherwise, is also bad for business. So while companies have a responsibility and duty to eliminate any hazardous substances completely from their products and processes, they should also be aiming to reduce all waste. And when they succeed, it will be a win-win situation for the environment, and for them.

It can be done. Companies are doing it through applying cleaner production or eco-efficiency, two closely interlocked concepts that hold the key for business to improve our environment and health, and boost corporate profitability at the same time. Let me give two examples.

■ In the early 1990s, Beijing Chemical Factory No. 3 (BCF3), one of China's main producers of additives for polymer products, like paints and plastics, was in trouble because production costs were rising due to its obsolete equipment and the inefficient use of raw materials. The plant was also the third largest polluter in the Beijing region, discharging organic pollutants to the air and the Liang Shuihe river system.

Installing expensive wastewater treatment could have tipped the company into bankruptcy. Instead, BCF3 initiated a cleaner production audit. This identified 20 options for action. Nine were introduced rapidly. They cost a mere $1,200 to implement, and saved $30,000 a year – a payback period of just 15 days.

Then the factory carried out a special audit of its butyl acetate plant, chosen because of its overconsumption of raw materials and the heavy chemical pollution in its effluent. These increased costs were threatening its financial viability. The audit identified a number of low-cost measures that, when implemented, cut consumption of acetic acid and butyl alcohol, both saving money and cutting pollution. They cost $20,000 to implement and generated annual savings of $55,000 – a five-month pay-back period.

Overall, BCF3 halved its water discharges, reduced its raw material requirements by 10 per cent, and cut energy consumption. Through this programme, competitiveness improved hand-in-hand with environmental performance.

The bottom line of eco-efficiency is that it benefits the bottom line

■ On the other side of the world, in April 1999, Dow completed a two-year collaboration with United States environmentalists to reduce toxic emissions at its Midland, Michigan site – the company's original chemical facility. Dow and the Natural Resources Defence Council recruited five local environmentalists to take part in this Michigan Source Reduction Initiative (MSRI). The initiative set aggressive goals: 35 per cent cuts in both the generation of a specific list of wastes and in emissions to air and water.

The result? By April 1999, the site was on track to cut waste generation by 37 per cent, and to reduce emissions by 43 per cent – beating the original targets. There was a financial pay-back too. Dow invested $3.1 million to make ▸

the changes, but they are expected to save the company nearly $5.4 million every year. Again, competitive gains were based on environmental improvements.

This is the key point. The bottom line of eco-efficiency is that it benefits the bottom line. This alone should be a compelling reason for every company to embrace the concept.

Eco-efficiency is about innovation – changing process or manufacturing technology, changing input materials, changing the final product, and breaking with business-as-usual. And companies must do things differently if they are to compete successfully, prosper and even survive in a marketplace where, increasingly, there will be no hiding place for laggards.

The truth is we are well beyond the point where firms can simply tinker at the edges, adding a few end-of-pipe technical improvements to reduce pollution. Business still has to produce, but must do so differently – through eco-efficiency, a totally integrated package that brings financial returns, as well as gains in quality, productivity and environmental performance.

Quantifiable benefits

And it patently makes sound business sense for any company to reduce its use of materials and energy, to conserve resources, to cut down on its waste – hazardous or not – and to reuse it wherever possible. The benefits are quantifiable in hard dollar terms.

But how is it to be done? At Dow we developed an 'eco-compass' to identify and evaluate improvements and innovations needed to move towards sustainability. Two of its six poles are mainly environmental – health and environmental risk, and resource conservation. The other four are also of business significance – energy intensity, materials intensity, revalorization (remanufacturing, reuse and recycling) and service extension.

Using the eco-compass, companies can find the breakthrough solutions to put themselves ahead of the competition – not in a haphazard way, but through a structured process of innovation that involves:

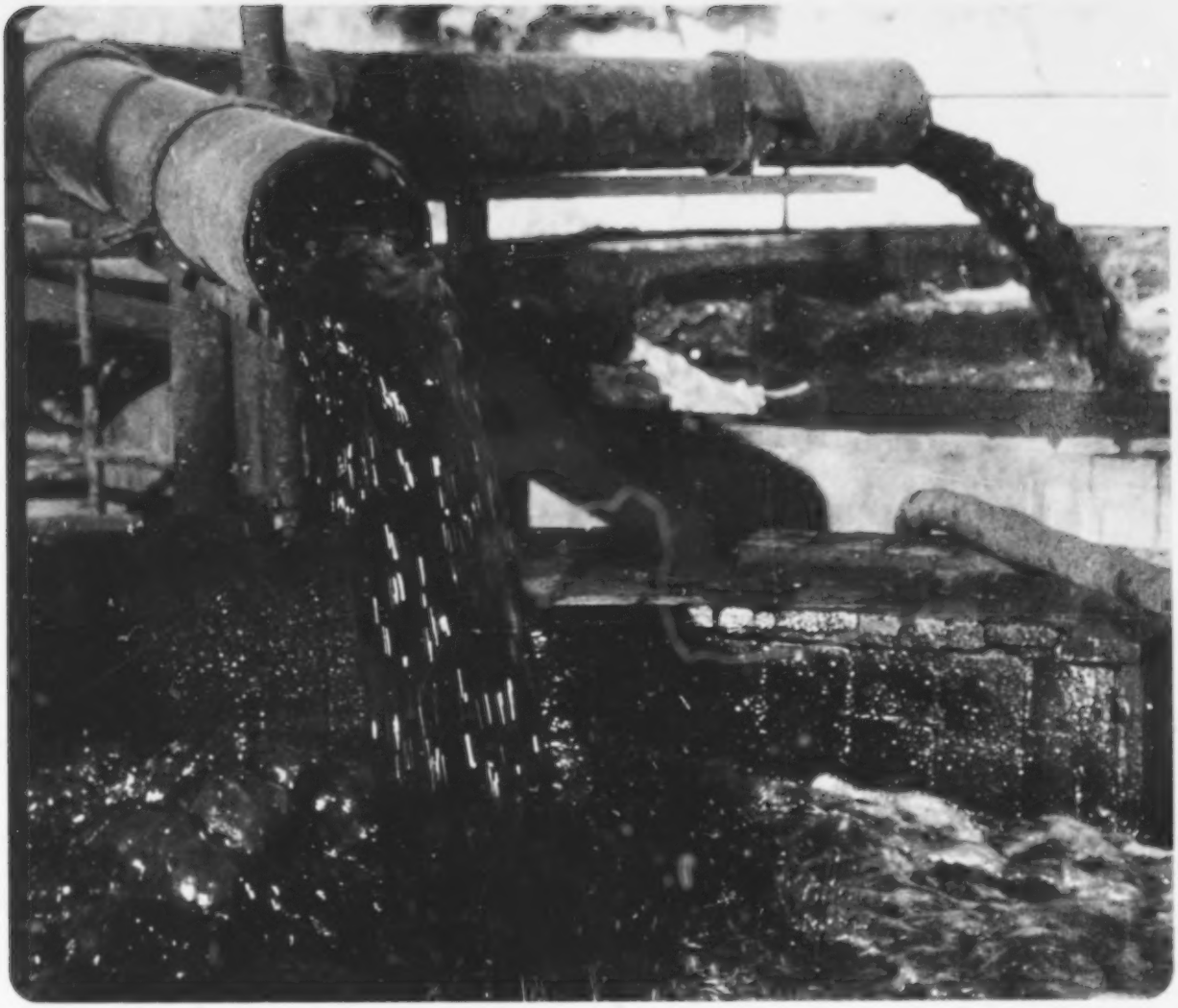
- **Accepting the challenge of eco-efficiency and assembling the key data.**
- **Identifying the opportunities.**
- **Organizing the best ideas.**
- **Pinpointing the potential winners.**
- **Implementing the most promising proposals.**
- **Setting clear targets.**
- **Introducing indicators of progress.**
- **Measuring progress.**

The targets must be ambitious. The gap between them and current performance presents the challenge to innovate, a design assignment for better processes, better products – and a better company. Moreover, people are energized by the challenge. And they should be rewarded and share in the success – because eco-efficiency works best with empowered employees in an environment of continuous learning.

Certainly, eco-innovation takes courage for managers. But the next 30 years will be rough. The world is not just demanding that business cleans up its act. It expects business to create more wealth with far, far less – four- to ten-fold less – resource intensity.

It is some challenge, but also an incredible business opportunity. Ask the Greek tannery that saved $43,000 a year by reducing emissions of chromium, or the Tunisian battery manufacturer saving $2 million over a two-year period for an investment of under $400,000. They need no convincing. It can be done – because it is being done ■

Claude Fussler is Vice President at Dow Europe and is currently serving as Director of Stakeholder Relations at the World Business Council for Sustainable Development.



NOT ON Planet Earth!

MARCELO FURTADO and **KEVIN STAIRS** say that the Basel Convention is an essential tool for achieving clean production, environmental justice and sustainable development

Generating toxic products and hazardous wastes can soon be a thing of the past. We are now poised to achieve this historic shift to clean production, thanks to sound, recent international decisions.

The late 1980s and 1990s witnessed the adoption of the precautionary principle, based on preventing pollution. At the same time, two-thirds of the Earth's surface – the oceans – were closed to waste management, through global bans on dumping industrial and radioactive waste in them, and on incineration at sea. And, in 1994, a measure adopted under the Basel Convention banned toxic waste exports from highly industrialized countries to less developed ones.

These decisions do more than just stop direct pollution. They are also a driving force, providing an incentive for industries to employ clean production methods and thus avoid generating toxic waste in the first place.

Thus, the Basel Convention can be one of the most important instruments in the transformation to a clean production-based economy – a prerequisite for sustainable development. It is not just about stopping pollution being transferred from richer to poorer. It goes beyond 'Not in My Back Yard' to 'Not on Planet Earth'.

Some industries reacted to the stopping of ocean dumping, more stringent environmental protection regulations and higher disposal costs in the rich nations, by seeking an ▸

The process of change was by no means smooth

alternative solution to waste disposal – dumping on the poor. Arms and drug traffickers even started to seek out poor nations willing to exchange poison for cash.

The waste trade follows the path of least resistance. The poorer and less informed the community (or country), the more likely it is to become a target for the traders. So poorer communities have always ended up with a disproportionate share of toxic waste.

As the Basel Convention was coming into being, both developing countries and environmentalists alike wanted to end this destructive dynamic with a ban on the export of all hazardous waste from rich nations (who generate most of it) to the less industrialized ones. But, when the Convention was adopted in 1989, it fell far short of this. It originally merely set out to monitor the movement of waste, rather than to prevent it, and so was heavily criticized for legalizing what many considered a crime.

Africa takes the lead

Africa, the first target for hazardous waste dumping, reacted by being the first to establish a regional ban on waste imports – the Bamako Convention. Latin America followed with a number of national bans and a regional agreement between Central American governments. Then the Mediterranean and Pacific States established their own regional bans in the Barcelona Convention and the Waigani Treaty.

As a result Asia became the main target of the dumpers. In addition, waste dumping became disguised as 'recycling', with hazardous waste renamed as 'products' or 'secondary raw material'. Even so-called legitimate hazardous waste recycling creates a circle of poison – generating, recycling and disposing of hazardous materials with pollution at each stage.

In all, it took almost a decade for the international community to accept the message from the developing world to the industrialized nations: 'We Don't Want Your Toxic Waste!' The historical 1994 Basel Ban decision (incorporated as an amendment to the Convention in 1995) – prohibiting the wealthy, OECD countries from exporting hazardous waste for any reason, including recycling, to non-OECD states – set the record straight.

The process of change was by no means smooth. Many industries fought heated campaigns for free trade in hazardous wastes. Some used misinformation and economic terror tactics. A few OECD governments constantly used their political machines to try to undermine the Basel Ban by weakening its language, questioning its definitions and threatening to circumvent it.

There was a clear division. On one side was dirty industry – and some industrialized governments taking instructions from it. On the other were the majority of states and those industries willing to move towards cleaner alternatives. Thus a few countries, with the greatest capacity for dealing with the hazardous waste crisis, became the main obstacle to solving it. Fortunately, the will of the majority prevailed.

The battle is not yet over. The Basel Ban is a judicial and environmental victory; but it still requires a number of ratifications from states to enter into legal force. And, despite the ban, some industries and some governments will continue to seek loopholes in the Convention so as to go on exporting their hazardous wastes.

The aims of the Basel Convention, including the Basel Ban are to:

■ Minimize – and aim to eliminate – the generation of hazardous waste and its movement across boundaries.

■ Ban the transfer of pollution and implement pollution prevention. The richest nations generate most toxic waste and should be responsible for their own waste crisis. Unless the floodgates that allow toxic waste to flow from rich to poor communities are closed, there will be no incentive to prevent it being generated.

■ Take responsibility. All nations should handle their waste crisis in environmentally sound ways, placing the emphasis on avoiding generating hazardous waste.

■ Tackle the causes not the symptoms. A sustainable future can only be obtained by changing manufacturing processes. When polluting industries stop using hazardous materials, they stop producing toxic waste. That is clean production.

Clean production is not a futuristic concept, but a current reality. Cleaner alternatives are being introduced into the market. Toxic organic solvents used to de-grease metal surfaces and circuit boards, for example, have been replaced by citrus-based oils – or just soap and water.

The electronics industry fought, during the Basel Ban negotiations, to keep computer nickel-cadmium batteries out of the scope of the waste trade ban. After it lost, the same industry introduced over 10 alternative batteries – all free of such heavy metals. This is an example of the Basel Ban creating market opportunities for cleaner alternatives. As cheap and dirty escape routes are closed, polluting industries are forced to address and implement real, non-polluting solutions.

Clean goods, clean services

The Basel Convention is now 10 years old. Greenpeace's birthday wish is that in the coming years the Parties to this Convention will succeed in using this international treaty as one of the main tools driving us into a toxic-free future. The few industrial countries which historically have been an obstacle to environmental solutions must stop protecting their polluting industries and become leaders on the path to sustainable development – an economic system based on the clean production of goods and services ■

Marcelo Furtado, based in Brazil, coordinates the Greenpeace International campaign against Toxic Trade. Kevin Stairs, based in Amsterdam, is the Greenpeace International policy advisor for Trade and Toxic issues.

At a glance: waste
Ten years on

UNEP

IN MARCH 1989, 116 states assembled in Basel, Switzerland, to adopt the first global environmental treaty regulating transboundary movements and disposal of hazardous waste, the Basel Convention. Switzerland is proud to welcome the Fifth Conference of the Parties to the Convention again to Basel, to celebrate the achievements of the last decade and to chart the course for future work. The Basel Convention constitutes an important step in dealing with a problem of global dimensions, aiming at protecting human health and the environment against the ill-effects of hazardous wastes. Significant achievements have been made in implementing and developing the Convention during the last decade. However, its objectives have yet to be reached.

We do not know the exact amount of hazardous wastes generated in the world today, but estimates indicate a volume of 300 to 400 million tonnes a year, mostly produced in industrialized countries. Shipments of hazardous wastes from OECD to non-OECD countries have been prohibited under the Convention, thus protecting the latter from unwanted waste imports – but illegal traffic still poses a serious threat to the environment and human health.

Enhanced efforts are needed to achieve environmentally sound management of hazardous wastes worldwide. First, we must strengthen our cooperation with developing countries and countries in transition. They require continued assistance from industrialized countries in building up institutional infrastructures and in building or improving installations for the environmentally sound treatment of wastes. This includes information exchange, pilot projects on state-of-the-art or best available technologies, training and technology transfer. In certain cases – such as the problem of obsolete pesticide stocks – industrialized countries may even have a moral duty to assist developing countries by taking back wastes and disposing of them. Switzerland, as a nation hosting the headquarters of several multinational chemical companies, is working on a number of projects to help solve this problem.

Second, we must strengthen our efforts to prevent the generation of hazardous wastes, which mainly stem from industrial production processes and products. This requires strategies for cleaner production processes and more environmentally sound products. Such strategies cannot be developed and implemented successfully without the active participation of industry. Given the high cost of disposing of hazardous wastes, it seems much more economically profitable to invest money in cleaner technologies (which simultaneously save raw materials and energy), than to spend it on the residues of the production process. Preventing the generation of hazardous wastes concerns countries, but, again, developing countries and countries in transition need special assistance. To this end, Switzerland supports close cooperation between existing national centres for cleaner production and regional and subregional centres for the training and technology transfer established under the Basel Convention.

Finally, given the close linkages between hazardous waste and chemicals management, the international community should develop a global regulation network in these areas, comprising the Basel Convention and the new agreements on chemicals which are currently being negotiated. Switzerland will continue to support the existing competence centre for chemicals and the Secretariat of the Basel Convention in Geneva as the main components of such a network ■

Philippe Roch
State Secretary
Director of the Swiss Agency for the Environment, Forests and Landscape

Thomas Lampe/Still Pictures

Alberto Esteban/AFP/Getty Images

Keeping the environment and people safe from harmful chemicals means using cleaner production

Klaus Töpfer, Executive Director, UNEP

A VISITOR from outer space, examining modern industrial economies, might well decide that their main purpose was to turn raw materials into waste. For they produce vast amounts of it – 5 tonnes a year of solid waste for every European, far more for each citizen of the United States of America.

It is increasing, rising by 10 per cent in Europe over the first five years of the 1990s. And so is public concern: 17 in every 20 European Union citizens are concerned about industrial waste. They worry about leaking waste tips, pollution from incineration plants, and contaminated land.

No-one knows how much of this waste is hazardous; records are incomplete and national definitions of it vary. The European Environment Agency reports that, in the early 1990s, Western Europe produced 42 million tonnes of it, Russia some 20 million tonnes, and Eastern Europe some 10 million tonnes. What is certain is that, if not properly managed, it can pose a grave threat to health and the environment.

The two most common methods of disposal, landfill and incineration, both pose serious risks if not carried out to the highest standards. Illegal trading in hazardous waste is another major problem, though the legal trade is being brought under control by the Basel Convention.

Waste disposal experts, as well as industrialists, environmentalists and governments, increasingly agree that the answer is to produce as little waste as possible in the first place, through the related concepts of cleaner production and eco-efficiency. Cleaner production generates less waste, and reuses and recycles more of what it does produce. Eco-efficiency uses less raw materials: there is a growing consensus that industrial societies could cut consumption of them by 90 per cent, while still greatly improving living standards.

Geoffrey Lean

Bellona Logo/UNEP/Topham

Hundreds of millions of used tyres are removed from cars worldwide each year – about 200 million in the European Union alone – and pose a particularly intractable waste problem. Vast numbers – about half of those in the EU for example – are sent to landfill. But they remain intact for decades, and often rise to the surface. They can catch fire: one fire of 10 million tyres has been burning in Wales for 10 years. Many tyres are retreaded and used again. Some have been used to create artificial reefs or defend land from erosion by the sea. Much more could be used for fuel: they have a greater calorific value than coal and can be burned relatively cleanly. But so long as the number of cars around the world continues to grow, so will the problem of what to do with their tyres.

Michael Smith/UNEP/Topham

Landfill is much the most common means of disposal: the cheapest legal option, it is used, for example, for three-quarters of Western Europe's wastes. But landfills can contaminate groundwater with heavy metals, persistent organic chemicals and other poisons – and they are one of the largest emitters of methane, which contributes to global warming.

Recycling and reuse of waste materials provides one solution. Over a third of Western Europe's municipal rubbish is recycled, reused or used to provide energy. Almost all US states have passed laws establishing recycling or reduction targets aimed at reducing their waste by between 20 and 70 per cent. Germany, which introduced pioneering legislation on packaging, recycles more than two-thirds of its paper; Japan recycles more than half.

Cherry Muir/UNEP/Topham

K.J. Scott/NPI/Typhoon

Ian Plume/Still Pictures

Tens of thousands of square kilometres of land have been contaminated by past poor practice in handling hazardous wastes, including inadequate landfill. There are 40,000 such sites in the United States, 55,000 in just six European countries, and 7,800 in New Zealand. Cleaning them up is enormously expensive; the US Environmental Protection Agency estimates that dealing with just the 1,400 top priority sites will cost $31 billion.

Dumps of dangerous and obsolete pesticides plague many developing countries. There are thought to be at least 20,000 tonnes of them in Africa, and 80,000 tonnes in Asia and Latin America. Often they were provided by aid agencies. There is now an international effort to clean them up, but so far less than 3,500 tonnes of them have been removed from Africa and the Near East, at a cost of $24 million.

Traditionally pollution and waste were tackled by 'end of pipe' measures designed to treat them once they had been produced. Now the solution is seen as producing less waste in the first place. Such 'cleaner technology' can simultaneously achieve a dramatic reduction in wastes and increases in profits.

Thomas Raupach/Still Pictures

Raquel Becerril/NPI/Typhoon

Waste is a growing problem in developing countries. Latin America is generating more than twice as much solid waste per head as it was a generation ago, while rapid urbanization has increased the amount produced in Lagos six-fold. In some cities 90 per cent of waste is not collected, mainly because of lack of resources, causing pollution and disease. Much of what is collected is disposed of inadequately. Two-fifths of Latin America's disposal facilities do not meet even minimum standards, and are little more than rubbish tips: many countries have no sanitary landfills outside their capital cities. Between 20 and 80 per cent of solid waste generated in North African towns and cities is dumped in open spaces. And a large percentage of Southeast Asia's rapidly increasing industrial waste (in the Republic of Korea it rose by 50 per cent between 1991 and 1995 alone) is discharged without treatment.

UNEP

What UNEP is doing

● **The Basel Convention,** developed under UNEP's auspices, which celebrates its 10th anniversary in December, is the broadest and most significant international treaty on the transboundary movement and environmentally sound disposal of hazardous wastes.

● **The Rotterdam Convention,** negotiated under the auspices of UNEP and the Food and Agriculture Organization of the United Nations, and adopted in September 1998, lays down, among other measures, that hazardous chemicals and pesticides that have been banned or severely restricted in at least two countries should not be imported except with the specific agreement of the importing country.

J.P. Delobelle/Still Pictures

● **Another treaty** is being negotiated, again under UNEP's auspices, to protect public health and the environment against Persistent Organic Pollutants (POPs). At the last round of talks, in September, 115 nations agreed on proposals favouring the elimination of 10 POPs, including the pesticides aldrin, dieldrin and toxaphene.

Didier Constant/UNEP/Topham

● **UNEP has pioneered** the promotion of cleaner production for a decade. It has:

• launched an International Declaration on Cleaner Production, which now has 159 signatories, including 34 national governments and 41 companies.

• established, with the United Nations Industrial Development Organization, 15 National Cleaner Production Centres in developing and Eastern European countries.

• set up a collection of databases, the International Cleaner Production Information Clearing House, to provide information.

WIN A FREEPLAY WIND-UP RADIO

Answer these three simple questions and tell us in not more than fifteen words what you would do to reduce environmentally damaging waste.

1. What convention celebrates its 10th anniversary in December 1999? _____
2. How many landfill sites are there in the United States of America? _____
3. Which country recycles more than two-thirds of its paper? _____

'I believe environmentally damaging waste could be reduced if

_____

_____

My name _____

Address _____

_____

Three first prizes of FREEPLAY S360 wind-up radios, the use of which produces no wastes, donated by FREEPLAY ENERGY, and three runner-up prizes of solar-powered calculators must be won.

Entries must be received by SMI, PO BOX 119, PIN GREEN, STEVENAGE, HERTFORDSHIRE SG1 4TP, UK, or basel@ourplanet.com no later than 15 March 2000.

The winner and runners up will be chosen by a panel consisting of UNEP's Executive Director, its Director of Information, and the Editor of *Our Planet* from the entries received. The decision of the judges is final.

This competition is closed to all those working for UNEP, Banson, Words and Publications, SMI, Freeplay Energy, Splash Communications, and all other companies associated with the production of *Our Planet* magazine and their families. A full set of rules is available on application from basel@ourplanet.com

What you can do

● **Cut down** the waste you produce. Avoid buying over-packaged goods and the wasteful use of paper.

● **Reuse materials.** Avoid disposable goods. Buy food, drinks and toiletries in returnable containers. Take unwanted clothes, books and other goods to charity shops, and buy from them too.

● **Recycle** paper, glass, plastics, cans, textiles, oil and wood and make compost from organic waste. Buy recycled products.

● **Take special care** in disposing of household goods containing toxic substances – including batteries, paints, pesticides, medicines, oil and petroleum products and plastics. Return to proper facilities where possible.

● **Lobby** your political representatives, media, industries and shops to support and implement measures to reduce waste and manage it in environmentally sound ways.

David Hoffman/Still Pictures

It's a **WASTE**

ALEX KIRBY outlines the problem of disposing of hazardous wastes and talks to experts about a solution

The trouble with the throw-away society is that there is no such place as 'away'. What we think we have thrown away is liable to come back to haunt us.

For a long time we managed to believe that what was out of sight was not going to be a danger, at least to us. Traditionally both hazardous and other waste has been put into holes in the ground. This was cheap and simple, and no-one could see the poisons leaching out of the waste and into the groundwater, organic waste generating explosive concentrations of methane gas, or the gas seeping out to contribute to global warming.

Nearly two-thirds of 100 countries canvassed in an international survey at the beginning of the 1990s said that at least some of their hazardous industrial waste was put in uncontrolled dumps. Both developed and developing countries are littered with such contaminated sites.

Regulations have been tightened, particularly in developed countries, and sites have greatly improved. But there is a limited number of such suitable landfills – and no shortage of governments with a reputation for overregulation, but underenforcement. Since 1976, OECD countries have formally listed landfill as the least preferred way of dealing with wastes after dumping at sea. Yet about three-quarters of Europe's hazardous and municipal wastes are still disposed of in this way.

If you cannot put the waste in a hole, you can burn it, and the OECD waste hierarchy does marginally prefer such incineration. But this, again, demands proper management and enforcement to make sure that the risks, which can be considerable, are kept as low as possible. Poorly run or outdated incinerators emit dioxins, furans and other highly toxic pollutants.

Modern, well-regulated incinerators have dramatically reduced such pollution. But it is becoming increasingly hard to find places to put them because people do not want them in their neighbourhoods. Rod Aspinwall, Deputy Chairman of the United Kingdom's Enviros consultancy, says 'incineration is now facing much the same difficulties as landfill did'.

One way of sweeping hazardous waste out of sight has been to export ▸

Drastically reducing waste makes good economic and environmental sense

it to countries willing to accept it. The snag here is that, naturally, the waste tends to go to countries where the cost of disposal is cheap, and these are often those where standards are low: some are very unlikely to be able to afford to manage and treat it adequately.

Waste imports to Britain soared from 5,000 to 183,000 tonnes (an estimated 80,000 tonnes of it hazardous) between 1983 and 1987 as regulations grew more stringent in North America and Continental Europe. In 1988 more than 1 million tonnes of hazardous waste were exported from Western Europe to the then East Germany. And the European Environment Agency reports that some 120,000 tonnes of hazardous wastes have been legally shipped to developing countries each year, a trade dwarfed by large, if unquantified, illegal exports.

A toxic legacy

Developing countries also have to cope with a toxic legacy from the past. The Philippines has to deal with a heritage of persistent organic pollutants, including PCBs and organo-chlorine pesticides, left behind by the US military when it quit its bases at Clark and Subic Bay in 1991. Mozambique has a stockpile of more than 500 tonnes of obsolete pesticides, nearly 50 tonnes of which are globally banned. About 200 tonnes of the total are known to have been exported by two large Western companies. In many cases, the chemicals are stored in drums which are unlabelled and leaking. Other countries have been left with obsolete pesticides provided as part of aid programmes.

The Basel Convention now controls the hazardous waste trade. In some cases, industry's response has been to export itself rather than the waste, relocating to countries where controls on pollution and waste disposal are less strong than at home. Western consumers do not want reminding of the pollution that is, to some degree, inseparable from their lifestyles and so may turn a blind eye to the dirty part of the production business going to poorer countries.

With serious question marks over both landfill and incineration – and with the trade coming under control – the problem of what to do with hazardous wastes (and wastes of all sorts) is increasing. And so are the wastes themselves. Peter Jones, Director of Development at Biffa Waste Services Limited, has estimated that every tonne of goods produced in Britain, for example, gives rise to at least 10 tonnes of waste, and often more.

'We are running a highly efficient waste generation economy in a framework of total resource consumption,' he says. 'In some cases that means that we capture only about 1 per cent of the resources that enter the economy.'

Is this really necessary? The OECD waste hierarchy shows the way out, by giving the highest priorities to reusing waste and, even better, cutting the amount that is produced in the first place. Clean technologies minimize waste and make better use of raw materials. It may not always be possible to eliminate waste entirely – some processes will inevitably result in hazardous by-products – but drastically reducing it makes good economic and environmental sense. Waste can become a resource.

Resource-efficient society

Peter Jones stresses that this remains a minority view: 'Most companies are just looking for quick fixes, like saving and recycling paper,' he says. 'Very few are asking: Why are we making this in the first place? How can we change the composition of our product so that what is left behind can be useful to someone else?'

But some companies have advanced well down this road. Rod Aspinwall, who helps firms to think through what sustainable development means for them, says: 'There are big agendas opening up for big corporations about corporate citizenship and sustainable development. Some transnational corporations are thinking about a more resource-efficient society – and they will not be imposing burdens on developing countries.'

If this view takes hold waste will be seen for what it really is – a waste ■

Alex Kirby is a journalist and broadcaster specializing in environmental issues.

CONSUMER PRODUCTS CONTAINING HAZARDOUS WASTES

Many consumer products contain hazardous chemicals. Such 'household chemical wastes' are increasing. There is little information about their extent, but The Netherlands is estimated to produce 41,000 tonnes of them a year.

They are particularly important because they are usually disposed of as normal rubbish, without the special precautions laid down for hazardous wastes. Special care needs to be taken in disposing of them. Some countries segregate them from other household waste before sending it for disposal. In other countries municipalities may make special arrangements to receive them, or retailers may take them back for disposal.

PLASTICS	organochlorine compounds, organic solvents in PVC
PESTICIDES	organochlorine compounds, organophosphate compounds
MEDICINES	organic solvents and residues, traces of heavy metals
PAINTS	heavy metals, pigments, solvents, organic residues
BATTERIES	heavy metals
OIL, GASOLINE (and other petroleum products)	oil, phenols and other organic compounds, heavy metals, ammonia, salt acids, caustics
METALS	heavy metals, pigments, abrasive plating salts, oils, phenols
LEATHERS	heavy metals
TEXTILES	heavy metal dyes, organochlorine compounds

List compiled by the European Environment Agency

Move these poisonous mountains

Ron Giling/Still Pictures

CHEIKH HAMALLAH SYLAH and **MARK DAVIS** describe the menace of tens of thousands of tonnes of obsolete pesticides building up in developing countries

Rotting mountains of old and unuseable pesticides have been building up in developing countries for decades. They expose whole communities to insidious and persistent poisons in their air, water and food.

In Ethiopia 1,500 tonnes of pesticides lie scattered in over 400 locations around the country. Some are close to wells, others on river flood plains; there are even mounds of burst sacks and leaking drums in residential areas of the capital, Addis Ababa. In Nepal, the watershed for much of Asia, 150 tonnes of obsolete pesticides have accumulated since the 1950s. In Nicaragua, there are more than 1,100 tonnes of them, including over 81 tonnes of DDT stored in a cancer treatment hospital.

Many of the chemicals in these stockpiles have long since been banned in many countries because of their disastrous impact on the health of people and the environment. Aldrin, chlordane, dieldrin, endrin, heptachlor, mirex and toxaphene are commonly found in the neglected stores of Africa, Asia and Latin America – but these are the very kind of chemicals that the world is now preparing to ban through a convention on persistent organic pollutants. Almost no corner of the developing world is free of such legacies of past malpractice.

It is easy, in the stocks of some of the world's poorest countries, to find pesticides labelled in strange languages, products designed for use on crops that have never been grown there, and containers marked with expiry dates which turn out to have been long before the chemicals were delivered. They have been donated by unscrupulous agencies in the developed world and dumped in developing countries in the guise of aid.

Donor nations have also been somewhat overeager to send pesticides to the developing world as part of aid designed to improve agricultural productivity. Often they would arrive in packages too large for local farmers to use, in formulations ▸

Ron Giling/Still Pictures

The current problems and the legacy of the past still need to be solved

which did not match available application equipment, or in the wrong place and at the wrong time. Some agencies still supply large amounts with little regard for actual need.

Elsewhere the legacies of centralized supply systems are piled high. Officials far from farms and rural areas would place an order for pesticides with no knowledge of how much was actually used in a season. Year after year the orders were repeated and dispatched, but never used. The stores filled up, but the oversupply was never reported. Now they cannot be used and may already have leaked into the ground or nearby watercourses.

Best intentions

In other places pesticides were sent, with the best of intentions, to be held at the ready for potentially devastating outbreaks of pests such as desert locust and army worm, but the outbreaks never came, and the poisons burned their way through their steel drums and seeped into the environment.

In all, it is conservatively estimated, there are 20,000 tonnes of obsolete pesticides in Africa, accumulated over 30 years. Asia and Latin America are thought to contain at least another 80,000 tonnes and Central and Eastern Europe may hold another 200,000 tonnes. Nobody knows the figures for certain, because almost no detailed surveys of stockpiles have been made.

The challenges for both the international community and authorities in developing countries are to remove these mountains of poisons safely and to prevent any new accumulation of unwanted ones. The Food and Agriculture Organization of the United Nations has been helping developing countries dispose of obsolete pesticides, and put effective prevention measures in place, for five years. Several international development agencies have also supported clean-up operations. But so far less than 3,500 tonnes of pesticides have been removed from African and Near Eastern countries, at a total cost of $24 million. At this rate it will take 50 years to clear Africa of existing stocks and the cost could well exceed $100 million.

There are, at present, few options for destroying these toxic chemicals. They are mostly repacked and sent to dedicated high-temperature incinerators in Europe. This is expensive, and it does little to help developing countries deal with their own hazardous waste – and many European communities object to the resulting contamination of their environments. But cleaner destruction technologies are not yet available.

Donor agencies do not like to spend aid money on destroying old chemicals, particularly if they helped to contribute pesticides in the past; it is much more appealing to spend money on health care, education and infrastructure. But there is little value in providing drinking water for remote communities if the water source is contaminated by toxic pesticides, or in helping villagers grow healthy food crops if their soil and air is similarly poisoned. Healthy and sustainable development must include removing both existing environmental pollutants and the soil and other materials that they have contaminated.

The global pesticides industry sold well over $32 billion worth of pesticides worldwide in 1997 alone. At a 9 per cent profit, a fairly typical figure, it could clear Africa and the rest of the developing world of all obsolete pesticide stocks in one year – and still make over $2 billion. Yet so far it has only contributed a few tens of thousands of dollars towards the removal of little over 200 tonnes of them. And the industry sees Africa, Latin America and Asia as growing markets for their products, while sales in Europe and North America are slowly declining.

Seeking solutions

There are hopeful signs of change. Some donor agencies, learning from bitter experience, no longer send pesticides; instead they support agricultural programmes based on low input regimes, like integrated pest management and organic production – and micro-credit schemes which help farmers to buy seed inputs in the amounts they need. Many developing country governments have stopped subsidizing pesticides, reducing oversupply and overuse. Most are also instituting regulatory systems to control the import and sale of such substances. Measures such as these will make it easier to prevent stockpiles building up in the future. But the current problems – and the legacy of the past – still need to be solved urgently ■

Cheikh Hamallah Sylah is Programme Officer at the Pesticides Action Network – Africa, and Mark Davis is Project Coordinator at the Pesticides Trust.

Broad, global **and dynamic**

IWONA RUMMEL-BULSKA describes the development and outreach of the Basel Convention

Trade in hazardous wastes has become a global problem, and it demands global solutions. About a tenth of all the hazardous wastes generated around the world each year crosses national frontiers. A large proportion of this has gone, and is still going, from industrialized countries to developing ones, where disposal costs are lower.

Unfortunately many of these countries still lack environmentally sound management of waste disposal. Stockpiles of corrosive acids, organic chemicals, toxic metals and other wastes pose serious, acute and long-term health and ecological threats, causing groundwater contamination, leaching and other types of pollution.

Frontline measures are urgently needed to cope with existing hazardous waste problems in developing countries. They will need to take action to minimize and manage the wastes, but their capabilities for setting standards, enforcing them, and monitoring what is happening are quite weak – and they are plagued by a scarcity of resources for sound hazardous waste management policies.

Need for action

The international community first began to recognize the need for urgent action on hazardous wastes in the early 1980s. Work began then, under UNEP's auspices, to elaborate a global instrument on managing wastes in an environmentally sound way, on their movements across boundaries, and on their disposal. The resulting Basel Convention – which was adopted unanimously by 116 states meeting in the Swiss city in 1989, and which entered into force on 5 May 1992 – is the broadest and most significant international treaty on the transboundary movement and environmentally sound disposal of hazardous wastes: 117 states, plus the European Community, are now party to it.

The Convention's overall goal is to protect human health and the environment against the ill-effects of generating and handling hazardous and other wastes, and from moving them across boundaries. Other objectives include:

- Reducing transboundary movements of wastes to the minimum consistent with managing them in environmentally sound and efficient ways, and controlling those permitted under the terms of the Convention.

- Minimizing the amount of hazardous wastes that are generated, and ensuring that they are managed in environmentally sound ways.

- Helping developing countries with the environmentally sound management of the hazardous and other wastes they generate.

The Convention helps to reduce waste by preventing hazardous shipments in five situations. Both importing and exporting Parties are required to block the movement of waste that the importing state does not want. They must prevent any shipment to which the importing state has not formally consented in writing. The exporter should prohibit any shipment if it has reason to believe that the wastes will ▸

Mark Edwards/Still Pictures

not be managed in an environmentally sound way. All Parties must prevent any shipment intended for disposal in Antarctica. And they must not trade in any waste involving a country that is not Party to the Convention.

Notification and consent

There is a strict control system, based on the procedure of prior written consent. Countries must be notified of shipments to them, and give their consent before they can take place. Both the notification and the consent must be in writing. The same goes for states that the waste will pass through in transit. Every person who takes charge of a movement of hazardous or other wastes across boundaries must sign an official document. And if a movement of hazardous wastes cannot be carried out in an environmentally sound way, the state exporting them has a duty to take them back.

In 1994, the Parties to the Convention went further and decided to ban all cross-boundary movements of hazardous wastes from OECD countries destined for disposal in non-OECD ones, but this has not yet come into force.

Trade in hazardous waste that does not comply with the terms of the Convention or its control system is illegal – and considered to be criminal. Parties are obliged to enact stringent national laws to prevent and punish it. The state exporting the waste is responsible for the actions of those who generate and export it, while the state that receives it is responsible for those of the importer and disposer. A state responsible for any action leading to an illegal movement must ensure its environmentally sound disposal, for example by sending it back to the exporting country, within 30 days of receiving information about it. If an otherwise legal movement cannot be carried out in accordance with the contractual agreement, the exporting state must take it back, unless alternative arrangements for environmentally sound disposal are agreed.

Big profits, bigger costs

The Convention cooperates with Interpol over illegal traffic. This trade is increasing, as it can yield big profits – at the cost of irreparably damaging the environment – and it tends to flow from developed to developing countries. But nobody knows exactly how big the problem is; though many cases of illegal traffic have been discovered, they are only a small proportion of those incidents that actually occur.

There must be cooperation between countries to build up the capacity to tackle illegal traffic. United Nations regional commissions, and other regional bodies or conventions and protocols, should take an effective part in monitoring and preventing this. It is also important that customs officers and port authorities are adequately trained and able to take full control of the hazardous wastes being moved across frontiers.

Parties are to cooperate in helping developing countries minimize the generation of hazardous wastes and their movement across frontiers. Measures can include ensuring that adequate disposal facilities are available, that managers are able to prevent pollution, and that, if pollution occurs, the consequences for human health and the environment can be kept to a minimum.

Chen Jin/UNEP/Typhoon

Under the Convention international cooperation is to be extended to developing countries in:

- Transferring technology and management systems.
- Developing and implementing new environmentally sound low-waste technologies, and improving existing ones to eliminate the generation of waste, as far as practicable – and studying the economic, social and environmental effects of adopting the new technologies.
- Developing and promoting environmentally sound management of hazardous and other wastes.
- Promoting public awareness.

Success in implementing the Convention depends on developing the adequate capacity to do so both at the national and regional levels. Regional and subregional centres for training and technology transfer in the minimization and management of hazardous wastes are crucial for developing countries that lack technology and trained people.

The Convention also obligates its Parties to cooperate with a view to adopting a protocol setting out rules and procedures over liability and compensation for damage resulting from transboundary movements and the disposal of hazardous and other wastes.

A collective force

International environmental law is dynamic. The Basel Convention has developed as its Parties have adopted new decisions and amendments. It is developing into the legal international act that not only deals with controlling the movement of hazardous wastes across boundaries, but engages with the larger issue of their environmentally sound disposal, and involves technical assistance. It represents the intention of the international community to solve this global environmental problem collectively ■

Iwona Rummel-Bulska is Chief, Enforcement and Compliance, Environmental Conventions Unit, UNEP.

A monumental **challenge**

PIERRE PORTAS says that the next big task for the Basel Convention is to promote the environmentally sound management and minimization of hazardous waste

Hazardous wastes continue to be generated. Chemicals become more and more complex, causing further difficulties in disposing of them. Many countries have neither the capacity nor the capability to manage their waste in an environmentally sound way – and will not get them in the near future. Emerging problems such as the fate of end-of-life equipment are just around the corner. And the toxic heritage – including the contamination of soil or the existence of large quantities of stockpiles of obsolete pesticides – is scary.

It all adds up to a monumental challenge for the world community. Developed countries already spend a sizeable portion of their gross domestic product just in managing waste. So, what next? Pragmatic and innovative approaches are needed.

Hazardous waste management is an integrated activity in which waste generators, carriers, disposers and other handlers in the chain share responsibility for ensuring that the job is done well. It is important not to think of it just as a matter for waste disposal contractors; those who generate waste, in particular, have the major role in providing the information needed for proper disposal decisions and for ensuring that environmentally sound choices are made.

Instrument for integration

The Basel Convention represents the only global and comprehensive international legal instrument that addresses the integrated dimension of hazardous waste. It provides for an effective and stringent system for controlling their transboundary movements and ensuring their proper disposal; it clearly defines the obligations of Parties to comply with its provisions. It addresses the critical and difficult issue of preventing and monitoring illegal traffic. Its legal framework is being strengthened further through the preparation of a protocol on liability and compensation. Furthermore, in the fast-evolving world of waste and control of hazardous chemicals, the Basel Convention has the capacity to nurture links and enhance synergies with other conventions or programmes that deal with the control of production, use, trade and disposal of such chemicals.

The first 10 years of the Convention concentrated on consolidating its control system, legal framework and operation through improving the classification of wastes and refining the work on their hazard characterization. One of the major challenges for its next decade is to improve the practical implementation of the concept of environmentally sound management. This is enlarging its focus by addressing issues such as patterns of production, product design, technological innovations and the behaviour of consumers. As a result, partnerships must be nurtured with all stakeholders – states, industry, services, environmental non-governmental organizations and municipalities.

The 131 Parties to the Convention have taken responsible action to meet this challenge, building on its achievements over the last 10 years. At the Fifth meeting of the Conference of the Parties in December 1999 the Parties will consider how to set the agenda for the next 10 years to meet environmentally sound management objectives.

Environmentally sound management should be guaranteed in any place at any time and should be accessible to everyone. The key element is practicability, in particular in local conditions and different circumstances, taking into account the macro-economics of waste management, including options ▸

David Hoffman/Still Pictures

for recycling or recovery operations. The Conference of the Parties has adopted the criteria and principles that constitute environmentally sound management, the framework in which concrete actions take place.

Environmentally sound management of hazardous wastes will require knowledge of:

- The purpose, scope and definition of the operation and descriptions of technologies and of the efficiency of the operation.
- Environmental hazards.
- The suitability of the waste for the operation.
- Opportunities for waste avoidance.
- Opportunities for recovery.
- Criteria for operating technology soundly, and related safety aspects. These should include, as appropriate for information purposes, examples of national and international standards and regulations.
- Principles for assessing the predicted environmental impacts of establishing and operating the facility, site selection parameters, technology options, and construction/design and management plans.
- Guidance on monitoring and, when needed, appropriate corrective action.
- Guidance on closure plans and aftercare.
- The economic aspects of the disposal or recovery operation.

Minimizing hazardous waste, and preventing it being generated in the first place, are fundamental to the practical implementation of environmentally sound management. Work in this field should build on the experience gained by UNEP and other international organizations such as the United Nations Industrial Development Organization.

This concerns:

- Identifying existing information on cleaner production methods for preventing the generation of hazardous wastes.
- Assessing available substitutes so as to avoid using hazardous substances as far as possible.
- Using the best available technology and cleaner production techniques on selected production processes.
- Eliminating obsolete technologies.
- Embracing integrated pollution control, and management plans for production facilities.

Progress in minimizing hazardous wastes will, of course, not alleviate the burden of disposing of existing hazardous

Locally affordable, socially acceptable and environmentally sound methods should be encouraged and promoted

wastes or of those that will be generated anyway, nor, naturally, where it is not practicable nor economically feasible to reduce hazardous waste generation unless proper action is taken. In many cases dumping – usually in largely uncontrolled and unplanned operations or sites – will continue to be the only option available.

There is considerable controversy and concern over the extent to which each country could or should seek to provide suitable, environmentally sound options for all its waste. There is fairly broad acceptance that developed countries should generally be expected to be self-sufficient in waste disposal, insofar as this is environmentally sound and economically efficient. But the position is different for other countries, particularly developing ones. There the question is one of judging the extent to which it is possible or necessary to provide a full range of facilities, when the need for at least the more specialized options may be very limited and out of all proportion to the cost and resource implications of providing them. The more specialized plant and equipment is invariably the most expensive to buy and operate, and needs the most skilled and trained people. Given fiercely competing demands on these countries' limited resources, the decision could be that the investment cannot be justified, and that export to a suitable facility elsewhere is the most appropriate, environmentally sound option on a short, medium or long-term basis.

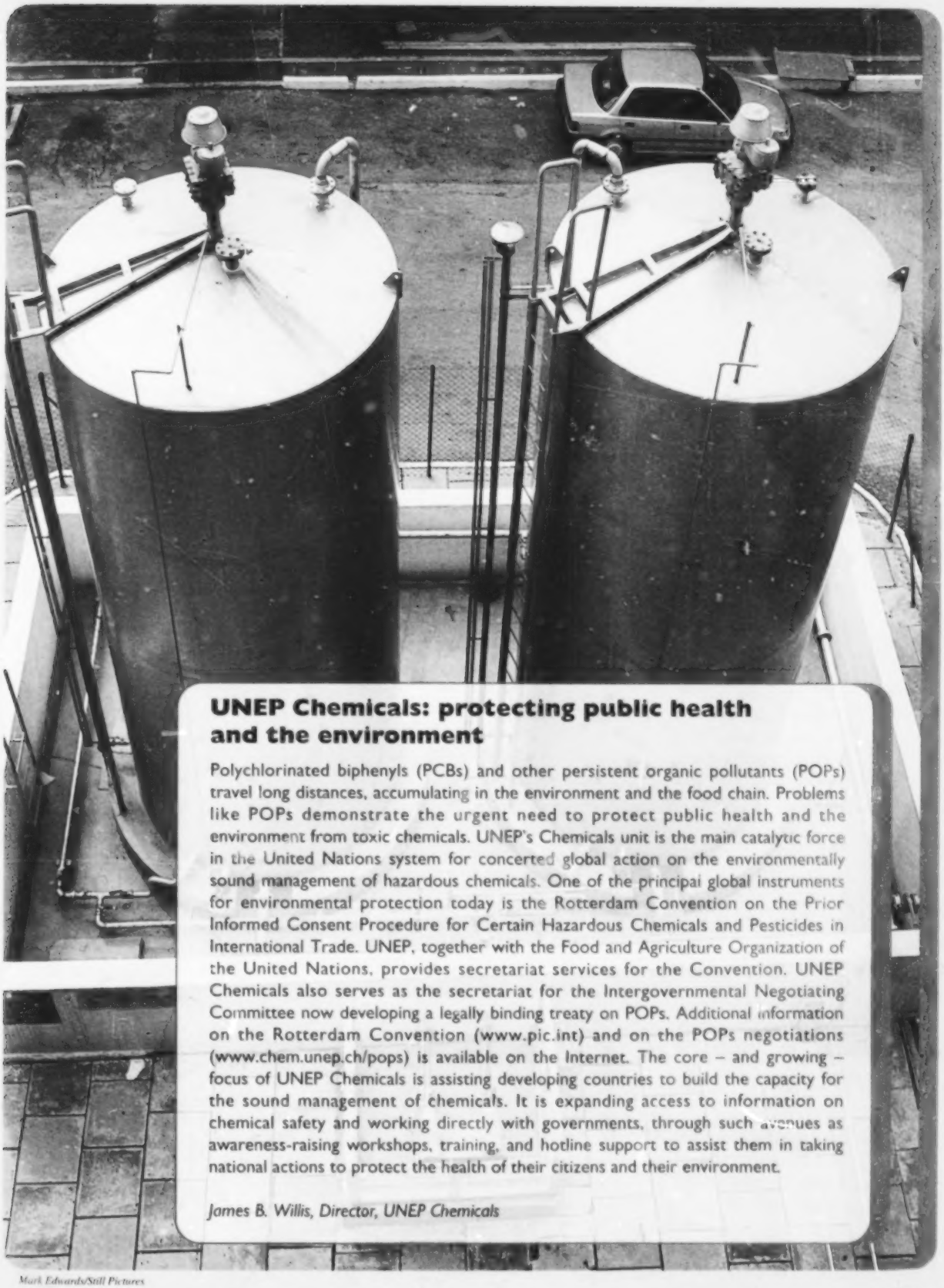
Need for innovation

Clearly, environmentally sound management will long remain unachievable, unless there are substantial efforts to help developing countries build their capacity to manage their waste properly and to reduce the worldwide generation of hazardous wastes. Innovative financial and economic mechanisms should be conceptualized, developed and used. Locally affordable, socially acceptable and environmentally sound methods, techniques and technologies should be encouraged and promoted, making use of the regional and subregional centres established in the framework of the Basel Convention.

In the Convention, the main focus will be on concrete actions to strengthen cooperation among all stakeholders for enhancing the prevention and minimization of the generation of hazardous wastes, and on the institutional, legal, scientific and technical capacity and ability of developing countries to access cleaner technologies and manage their waste in an environmentally sound way.

Environmentally sound management requires collective commitments. This fosters the hope that, by combining efforts and sharing the burden, the international community can come to grips with the immense challenge posed by the generation of hazardous wastes ■

Pierre Portas is Senior Programme Officer of the Secretariat of the Basel Convention.



UNEP Chemicals: protecting public health and the environment

Polychlorinated biphenyls (PCBs) and other persistent organic pollutants (POPs) travel long distances, accumulating in the environment and the food chain. Problems like POPs demonstrate the urgent need to protect public health and the environment from toxic chemicals. UNEP's Chemicals unit is the main catalytic force in the United Nations system for concerted global action on the environmentally sound management of hazardous chemicals. One of the principal global instruments for environmental protection today is the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. UNEP, together with the Food and Agriculture Organization of the United Nations, provides secretariat services for the Convention. UNEP Chemicals also serves as the secretariat for the Intergovernmental Negotiating Committee now developing a legally binding treaty on POPs. Additional information on the Rotterdam Convention (www.pic.int) and on the POPs negotiations (www.chem.unep.ch/pops) is available on the Internet. The core – and growing – focus of UNEP Chemicals is assisting developing countries to build the capacity for the sound management of chemicals. It is expanding access to information on chemical safety and working directly with governments, through such avenues as awareness-raising workshops, training, and hotline support to assist them in taking national actions to protect the health of their citizens and their environment.

James B. Willis, Director, UNEP Chemicals

Mark Edwards/Still Pictures

LATIN LESSONS

FLOR DE MARIA PERLA DE ALFARO describes Central America's measures to control trade in hazardous waste as part of its increasing environmental commitment

Central America is now seeking broader integration than ever before, aiming to combine social, economic and environmental issues to guarantee sustainable development for all its members. This new orientation is in keeping with economic globalization and its accompanying political and cultural transformation. There must also be a new outlook towards the rest of the international community if effective solutions are to be found to environmental problems.

The demands of environmental protection in the world market are becoming greater every day, but programmes aimed at achieving it are costly. As the region has only limited resources, a joint effort seems the most feasible way to respond to the challenges it faces.

A series of national efforts have been developed to protect the environment in the last few years. These in turn have led to regional agreements for cooperation in tackling environmental problems and harmonizing environmental policies. They can be divided into:

- Agreements aimed at strengthening the overall protection of the region, such as the Central American Commission for Environment and Development (Comisión Centroamericana de Ambiente y Desarrollo) and the Alliance for Sustainable Development (Alianza para el Desarrollo Sostenible) in its environmental clause.

- Cooperation agreements with third countries or groups of countries, notably the Joint Central American-USA Declaration.

- Agreements that help compliance with commitments made in international environmental conventions, such as the Regional Convention on Climate Change and the Regional Agreement on Transboundary Movement of Hazardous Wastes. This last was established in December 1992, and adopted measures for making it compatible with the Basel Convention.

Central American governments have good reason to believe that both individuals and corporations have dealt in illegally imported hazardous waste, and recognize that they must take immediate action to prevent such traffic. There is a growing consensus in favour of banning the transboundary movement and disposal of hazardous wastes in all countries. So governments in the area are agreed that it has become necessary to introduce regulations to control movements across borders.

Adaptation and improvement

The Regional Agreement takes into account the *Guidelines and Principles on Environmentally Sound Management of Hazardous Wastes* adopted by UNEP's Governing Council in Cairo in June 1987, among other international requirements and regulations. Integrating the sections of the Basel Convention which expressly allow current international regulations to be adapted and improved is particularly important.

Article 3 of the Agreement clearly states that Central American signatories should take all legal, administrative and other appropriate actions within the areas under their jurisdiction to prohibit the import and transit of hazardous wastes to Central America from countries that are not Parties to it. The Parties are committed to demanding that all offenders against this regulation adhere to the obligations in the Agreement, according to national and/or international law.

Another extremely important regulation states that each Party shall promote specific norms in its national legislation to penalize all those who plan, carry out or contribute to illegal traffic in hazardous wastes. These fines

John Vanni/UNEP/Topham

are to be severe enough both to punish and to discourage such conduct.

Central America must adapt its regional projects and legislation to the new national and international dynamics. At the national level, increasing urban concern about the quality of the environment has pressed governments to adopt adequate measures. One immediate measure would be dealing with the problem created by movements of hazardous wastes.

From regional to global

Meanwhile, environmental demands are also increasing at the international level, providing incentives for countries to draw up and apply well devised laws. Internal and external pressures have caused countries of the region to adhere to the increasing number of agreements to protect different aspects of our global environment – thus becoming obliged to comply with their conditions. This is reflected, for instance, in the adoption of the Basel Convention guidelines.

The increasing number of regional agreements confirms that cooperation is a key element in efforts to improve the environmental quality of the region. The commitment to international environmental conventions – or regional agreements linked to other international ones – clearly demonstrates the region's progress towards achieving sustainable development, eagerly desired by all ■

Flor de María Perla de Alfaro is Director of Environmental Quality, Ministry of the Environment and Natural Resources, El Salvador.

UNEP Sasakawa Environment Prize Winner

THE UNEP SASAKAWA ENVIRONMENT PRIZE FOR 1999 was awarded at United Nations Headquarters in New York to scientist and Massachusetts Institute of Technology (MIT) professor, Mario J. Molina, for his outstanding contributions in the field of atmospheric chemistry.

The Prize, worth $200,000 and sponsored by the Nippon Foundation, is considered one of the most prestigious environmental awards in the world.

'Professor Molina's pioneering investigations on the chemistry of the ozone layer have led to a better scientific understanding of the effect of human activities on the atmosphere,' said Lord Stanley Clinton-Davis, Chairman of the Selection Committee. 'The confidence with which many aspects of the science of ozone destruction is now understood comes directly from his work,' he added.

Professor Molina and his colleagues demonstrated a previously unknown reaction whereby chlorine is activated on the surface of ice cloud particles in the polar atmosphere. He also demonstrated a new reaction sequence involving chlorine peroxide, which accounts for most of the ozone destruction in the Antarctic.

'Professor Molina's leadership greatly contributed to making the UNEP-brokered Montreal Protocol on Substances that Deplete the Ozone Layer a reality,' said UNEP's Executive Director, Klaus Töpfer. 'The speed with which countries ratified this precedent-setting international agreement was due in great part to the role he played in communicating to policy-makers, the media and ultimately the general public the implications of his research,' explained Töpfer.

In 1995 Professor Molina, with Professors F. Sherwood Rowland and Paul Crutzen, was awarded the Nobel Prize in Chemistry. He donated two-thirds of his Prize money to set up fellowships to help scientists from developing countries conduct research in environmental sciences at MIT.

'This recognition by UNEP represents for me a culmination to my efforts on the protection of the global environment,' said Professor Molina.

'I appreciate the support I have received from the world community over the years, and I hope to continue my commitment to work for the benefit of humanity and the environment,' added Molina.

In addition to being a Professor at MIT, Molina continues his research on stratospheric chemistry and tropospheric pollution, including the pollution problems of rapidly growing cities ■

Of potholes AND ozone holes

K. MADHAVA SARMA describes the success of the fight against ozone depletion but warns against complacency

When scientists first published their discovery of how chlorofluorocarbons (CFCs) depleted the stratospheric ozone layer in 1974, they started a revolution not just in industry but also in international cooperation between governments, scientists, United Nations organizations and the media. The story of depletion of the ozone layer is now well known. The thin layer of the gas in the stratosphere efficiently screens out excessive ultraviolet radiation from the sun and allows through just enough to sustain life on Earth. More ultraviolet radiation leads to a range of effects, including skin cancers, eye cataracts, loss of immunity and reduction of plant yields.

CFCs, invented in 1928, are non-toxic to human beings, non-flammable, long-lived and versatile. These apparent 'wonder gases' became used in many industries such as refrigeration, air conditioning, fire fighting and metal cleaning. But scientists reported that they would eventually reach the stratosphere and destroy the ozone layer. Unless the use of the very profitable CFCs was phased out throughout the world, all life would be in danger.

UNEP's role

UNEP, in collaboration with the World Meteorological Organization, catalysed the world's governments to agree to the Vienna Convention on the Protection of the Ozone Layer in 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987. The Convention is a framework of intentions while the Protocol lays down a timetable for phasing out 95 chemicals by all its Parties. It provided a period of grace to developing countries in recognition of their difficulties in transforming their industries to ozone-friendly technologies. And since 1991 there has been a Multilateral Fund, to which the developed countries contribute, to help them.

Implementing the Protocol has had pleasing results:

- Fruitful collaboration between science, media, governments and United Nations organizations. Science has led to awareness, which in turn has led to new policies being made and implemented.

- A successful example of capacity building in developing countries. Almost all the Parties, including 120 developing ones, report data on the 95 controlled ozone-depleting chemicals each year.

- There is near-universal participation in the agreements. One hundred and seventy countries ratified the Vienna Convention, and 169 the Montreal Protocol.

- The industrialized nations have almost phased out their consumption of many of the controlled chemicals. Consumption has been cut from 1 million tonnes in 1986 to about 14,000 tonnes – only for essential uses. Globally, consumption has come down by 85 per cent.

- The Russian Federation and some countries of Eastern Europe, which were unable to comply with their 1996 phase-out schedule, have promised to complete it by the year 2000 with assistance from the Global Environment Facility (GEF). This is an example of the Protocol's facilitative and successful approach to enforcement.

- The GEF, the World Bank and donors have sealed a bargain with the Russian Federation to close its CFC production facilities by the end of 2000.

UNEP/Topham

Humanity must be forever watchful to ensure that ozone-depleting substances are banished from the world

■ The developed countries, minus the countries of the former USSR, have so far contributed $950 million to the Multilateral Fund.

■ The Executive Committee of the Fund has functioned excellently and has sanctioned projects that will phase out nearly 60 per cent of the consumption of developing countries. These are implemented through the United Nations Development Programme, UNEP, the United Nations Industrial Development Organization and the World Bank.

■ The Fund's Executive Committee has negotiated agreements with India and China gradually to close down their production facilities over the next 10 years.

■ Brazil has already closed its CFC manufacturing facilities.

■ The latest scientific assessment found that the abundance of ozone-depleting compounds in the lower atmosphere peaked in 1994 and is now slowly declining, proving that the Protocol is indeed working.

■ Scientists predict that ozone depletion will peak over the next two decades and, if the Montreal Protocol is fully implemented, the ozone layer will recover by the year 2050.

■ If there had been no Montreal Protocol, there would now be five times as much chlorine in the atmosphere and about 10 times as much ozone depletion. As a result, there would have been many more millions of cases of skin cancer and eye cataracts.

These positive developments instil confidence that the Montreal Protocol will succeed in protecting the ozone layer. But confidence should not lead to a complacent assumption that the problem has been solved. We must remember to negotiate carefully the potholes on the road ahead:

■ Ozone-depletion will peak in a few years and the ozone layer recover gradually only if the Montreal Protocol is fully implemented.

■ Global warming could adversely affect the ozone layer.

■ The Russian Federation and other countries of Eastern Europe will have to deliver on their promises to phase out by the end of 2000.

■ Developing countries will have to fulfil their part of the bargain, beginning their phase-out this year and completing it by 2010.

■ The Multilateral Fund will have to continue to be replenished each year until the task is completed. 'Donor fatigue' or complacency should not divert funds.

■ There is a danger of new ozone-depleting chemicals, not controlled by the Protocol, being introduced into the market. The Parties are now considering ways to tackle this.

■ Illegal trading in CFCs could cause backsliding by some industries.

Clearly humanity must be forever watchful to ensure that ozone-depleting substances are banished from the world. New technologies must be screened continuously to ensure that they are ozone-safe. The extraordinary spirit of cooperation of governments, scientists, technologists, media and the United Nations organizations must continue until the objective is achieved. Eternal vigilance is the price of a safe world ■

K. Madhava Sarma is Executive Secretary of the Secretariat for the Vienna Convention and the Montreal Protocol, UNEP.

Will we learn?

JOE FARMAN

UNEP/Topham

Fifteen years ago, at just this time of the year, I was waiting to learn the results of ozone measurements being made at the British Antarctic Survey bases. The results confirmed that a dramatic change in Antarctic ozone climatology was taking place. Soon the world was to be talking about the 'ozone hole'.

Concern about man's impact on the ozone layer became an international issue in 1970. Fears were first expressed about the projected fleets of supersonic stratospheric transport aircraft; but only Concorde went into service. In 1974 attention shifted to the chlorofluorocarbon (CFC) industry. Production of CFCs had quadrupled since 1960, they had spread worldwide, and their concentrations in the atmosphere were steadily increasing. American scientists pointed out that they were so stable that they would eventually reach the stratosphere, that they would release chlorine there, and that an ozone-destroying chain reaction would ensue.

PROGRESS SLOW – BUT SURE

A vigorous debate followed, but there was no concerted action. The United States of America, Canada and Scandinavian countries banned the use of CFCs as aerosol propellants. Other European countries, on the other hand, decided that the capacity for producing the chemicals should not be expanded, but that no specific restrictions on their use were needed. In 1978 UNEP established a coordinating committee to try to get international action. Progress was very slow, but eventually 23 countries signed the Vienna Convention in March 1985. The Convention acknowledged that there was a problem and agreed to collaborative studies, but the issue of controlling CFCs was deferred.

The discovery of the ozone hole helped bring about a breakthrough, in the agreement of the Montreal Protocol in September 1987. Its controls on CFCs were initially absurdly weak, but importantly it provided for frequent reviews – though these did not begin until 1990. Controls were successively tightened under these provisions in London, 1990, Copenhagen, 1992, Vienna, 1995 and Montreal, 1997 – and this winter the Parties are meeting again in Beijing.

The prospects for ozone recovery remain poor. Though chlorine reached its peak in the atmosphere in 1994 and has since decreased slowly, bromine (which also depletes ozone) is still increasing. There needs to be a fresh impetus to attempts to control its sources – halons and methyl bromide.

No halons have been made in developed countries since 1994, but large amounts are still used and stored in them, within the terms of the Montreal Protocol. Elsewhere production capacity has risen, especially in China. Freshly made halon is smuggled into developed countries falsely labelled as internally recycled material. Meanwhile, new evidence from Antarctic snow suggests that methyl bromide increased rapidly in the 1970s and 1980s, implying that some anthropogenic source has yet adequately to be quantified and controlled. Furthermore, increases in greenhouse gases exacerbate ozone depletion by making the stratosphere colder, even as they warm the Earth's surface.

CAPTURING MASS MARKETS

There is still a lack of commitment to prudent long-term goals. We need to break the cycle by assisting new halocarbon-free and energy-efficient technologies to capture mass markets against competition from the obsolescent established giants. We should try to protect the ozone layer, combat global warming and assist developing countries by one-off investment wherever possible.

Such is our industrial capacity that we can, in just a decade or two, affect the world so severely that it may take a century or more to recover. This is what happened over ozone depletion, where we performed what in retrospect will surely be seen as an unnecessary experiment. That the consequences have not been more severe must be attributed to luck rather than good judgement.

When will we learn? ■

Dr. Joe Farman, the 'discoverer' of the Antarctic ozone hole, is a consultant to the European Ozone Research Co-ordinating Unit, Cambridge, United Kingdom.